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THE LATE SIR WILLIAM HENRY FLOWER,  
K.C.B., F.R.S.

(PLATE II.)

OUR Science of Zoology has suffered a most severe loss by the death, at his residence, 26, Stanhope Gardens, on the 1st of July last, of Sir William Flower, until lately Director of the Natural History Departments of the British Museum, and for the last twenty years President of the Zoological Society of London.

Sir William had been, as is well known, in failing health for the past two years, and was compelled in 1898, under medical advice, to resign his important office at South Kensington. He passed the last winter with his family at San Remo, where it was hoped that perfect rest in a favourable climate might tend to restore him. But this was not to be the case, and he came back to England in May last with but little prospect of an ultimate recovery, as was painfully evident to the few friends who saw him after his return.

William Henry Flower, the son of Mr. Edward F. Flower, and member of a well-known family at Stratford-on-Avon, was born on Nov. 30th, 1831, and was educated for the medical profession at University College, London. When the Crimean War took place he entered the army as Assistant Surgeon, and served in the hospitals throughout the campaign, receiving the Crimean Medal with four clasps, as well as that given by the Turkish Government. On his return to this country young Flower, who

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had always shown a strong inclination for natural history and scientific work, and had become a Fellow of the Zoological Society of London in 1851, was appointed Assistant Surgeon and Demonstrator of Anatomy at Middlesex Hospital. He soon became a regular attendant at the scientific meetings of the Zoological Society, and in June, 1860, read an excellent paper on the structure of the gizzard in the Nicobar Pigeon and other granivorous birds. Flower's thorough and accurate style of investigation soon attracted attention, and led to his appointment, in 1861, as Conservator of the Museum of the Royal College of Surgeons. Here for twenty-three years he did excellent work in arranging and cataloguing the specimens, and in making large additions to the magnificent series of anatomical preparations belonging to that institution. Throughout this period Flower was also a frequent contributor to the publications of the Zoological Society, as will be seen by his numerous papers published in their 'Proceedings' and 'Transactions.' The difficult group of Cetaceans was one of Flower's favourite subjects, and six well-illustrated memoirs upon various members of this group in the Zoological Society's quarto 'Transactions' were the results of his labours. In 1869 Flower was chosen Hunterian Professor of Comparative Anatomy, and in 1870 published an important volume of introductory lectures. In the same year was also issued his 'Introduction to the Osteology of Mammals,' which went through two subsequent editions. During this period of his career his Catalogue of the specimens illustrating the Osteology and Dentition of Man and Mammals was prepared, besides numerous other papers and memoirs.

On the retirement of Professor Owen in 1884, Flower was appointed Director of the Natural History Museum at South Kensington, and during the fourteen years for which he held that post continued to exhibit the same admirable qualities in the discharge of his official duties which had signalized his career in Lincoln's Inn Fields. Every branch of the Institution under his government was carefully tended and improved, and the deficiencies existing in various parts of that vast establishment were one after another searched out and remedied. During this period the Director's time was, as might well be supposed, much taken up by his official duties; notwithstanding this, however, as



will be seen by reference to the Zoological Society's publications, constant communications were made to that Society (of which he had become President in 1879, on the death of the late Marquess of Tweeddale) on various zoological subjects to which he had devoted attention. Until this last two years, in fact, when failing health kept him at home, Flower was most constant in his attendance at all the meetings of the Society, both those for scientific purposes and those for ordinary business, and always manifested the greatest interest in every branch of the Society's affairs.

Flower was elected a Fellow of the Royal Society at the early age of thirty-three, and received one of its Royal Medals in 1882. In 1878 he was President of the Biological Section of the British Association, and in 1881 Chairman of the Department of Anthropology. In 1889 he became President of the whole Association for the meeting at Newcastle-upon-Tyne, and delivered the excellent address on Museums and their construction and management which was published in the Report of the Association for that year. From 1883 to 1885 Flower was also President of the Anthropological Institute. He was nominated President of the International Zoological Congress which met at Cambridge last year, but failing health compelled him at the last moment to transfer this office to Sir John Lubbock. He had likewise received honorary degrees from Oxford, Cambridge, and other Universities, and was a corresponding member of the Institute of France. He received the honour of the Commandership of the Bath in 1887, and was made K.C.B. in 1892. Finally, we may truly say that in private life no one was ever more deservedly esteemed and beloved than the late Sir William Flower. Most kind and affable to all classes, he was friends alike with all—high and low, rich and poor. No one ever heard him utter a rough word; no one met with otherwise than a most courteous reception when a question was to be asked or his advice was sought. During a very long and intimate acquaintance with the late Sir William Flower, the writer of this article never heard him utter an unkind expression towards anyone, or knew him swerve in the slightest degree from the most inflexible rectitude of purpose.

The published works and memoirs of the late Sir William

Flower are very numerous, but of these we may select his admirable 'Introduction to the Study of Mammals' (in which he was assisted by Mr. Lydekker) as being perhaps the most useful and generally known of any of them.

We add the titles of fifteen others of his more important publications.

P. L. S.

1. Introductory Lectures to the Course of Comparative Anatomy, delivered at the Royal College of Surgeons of England, 1870. 8vo, London, 1870.

2. An Introduction to the Osteology of the Mammalia. 8vo, 1870.

——— 2nd ed., 1876.

——— 3rd ed. Revised with the assistance of Hans Gadow. 8vo, 1885.

3. Catalogue of the Specimens illustrating the Osteology and Dentition of Vertebrated Animals, Recent and Extinct. Part I. Man; Part II. Mammalia. 8vo, London, 1879-84.

4. Fashion in Deformity (Nature Series). 8vo, London, 1881.

5. List of the Specimens of Cetacea in the Zoological Department of the British Museum. 8vo, London, 1885.

6. Recent Memoirs on the Cetacea by Professors Eschricht, Reinhardt, and Lilljeborg. Edited by W. H. Flower. (Ray Society.) Folio, London, 1866.

7. The Horse: a Study in Natural History. 8vo, London, 1891.

8. Essays on Museums, and other subjects connected with Natural History. 8vo, London, 1898.

9. Description of the Skeleton of *Inia geoffrensis*, and of the Skull of *Pontoporia blainvillii*, with Remarks on the Systematic Position of these Animals in the Order Cetacea. Trans. Zool. Soc. vi. p. 87. (1866.)

10. On the Osteology of the Cachalot, or Sperm-Whale (*Physeter macrocephalus*). Ibid. vi. p. 309. (1868.)

11. Description of the Skeleton of the Chinese White Dolphin (*Delphinus sinensis*, Osbeck). Ibid. vii. p. 151. (1870.)

12. On Risso's Dolphin, *Grampus griseus* (Cuv.). Ibid. viii. p. 1. (1872.)

13. On the Recent Ziphioid Whales, with a description of the Skeleton of *Berardius arnouxii*. Ibid. viii. p. 203. (1872.)

14. A further Contribution to the Knowledge of the existing Ziphioid Whales: genus *Mesoplodon*. Ibid. x. p. 415. (1878.)

15. On the External Characters of two Species of British Dolphins (*Delphinus delphis*, Linn., and *D. tursio*, Fabr.). Ibid. xi. p. 1. (1880.)



# BIOLOGICAL SUGGESTIONS. MIMICRY.

BY W. L. DISTANT.

(Continued from p. 315.)

In all reflections on the wonderful adaptations in nature by which living creatures obtain a protection from their enemies by assimilative colour or structure, we must remember that in the struggle for existence fecundity plays no small part in producing survival. As De Quincey spoke of man in China as being but a weed, so throughout nature we often find excessive reproduction alone preventing extermination, and quite replacing the aid of protective or mimetic disguise in the "survival of the fittest." It is no longer the protection of the few, but the superfluous number of the attacked that militates against annihilation. As Mr. Harting has observed :—"The enormous rate of increase in fish, as compared with the rate of increase in their natural enemies, will always result in there being enough to spare for man and Otter—ay, for Kingfisher and Heron too."\* Weismann recognizes the same truth in the remark :—"No better arrangement for the maintenance of the species under such circumstances can be imagined than that supplied by diminishing the duration of life, and simultaneously increasing the rapidity of reproduction."† Take the Orthoptera as found on the Transvaal veld—where most of these pages were written—which not only during the summer season literally supply the almost sole avian banquet, but are doubtless the prey of other enemies as well ; and, although the usual colouration of these insects is more or less approximate to the short grasses among which they live, no apparent protection is afforded thereby, and their great reproductive powers seem their only protection against extinction. The American Lobster is another case in point. Mr. F. H. Herrick, of the United States Fish Commission, who suggests that its habits are the same as that of the European representative, states that out of the 10,000 eggs produced at one time, not more than two arrive at maturity, and that even that estimate is probably too high, as the fisheries are

\* 'Zoologist,' 3rd ser. vol. xviii. pp. 44-5

† 'Lectures on Heredity,' &c. Eng. Transl. 2nd edit. vol. i. p. 17

now declining.\* This diminution may well take place, for, according to Prof. Henry Woodward, of the common species *Homarus vulgaris*, as many as 25,000 live specimens "are often delivered at Billingsgate in one day. If only as many are eaten in the whole of England as in London, this would be at the rate of 50,000 per day, or 18,250,000 annually. . . . From Norway as many as 600,000 are received annually."† Marine animals commonly produce far more eggs than insects. The dangers of the shallow seas are so great that a small proportion only of the young animals come to maturity. Hence the enormous fertility of common marine animals, except such as are able to nourish or defend their young. Vast numbers of Zoëa are swept into mid-ocean or into tidal rivers, or are devoured. It is only a chance remnant that survives.‡ Prof. Möbius says that out of a million oyster embryos only one individual grows up, a mortality due to untoward currents and surroundings, as well as to hungry mouths.§ Leuckart calculates that a tapeworm embryo has only about one chance in 83,000,000 of becoming a tapeworm.||

The fecundity of fish is shown by the following table of the number of ova in different species, as found by Frank Buckland's observations :—

Name of Fish.	Weight of Fish.		No. of Eggs.
	lb.	oz.	
Salmon. (The average number of eggs in a Salmon is 850 to each pound weight) ..	12	0	10,000
Trout .....	1	0	1,008¶
Carp .....	14	8	633,350
Perch .....	3	2	155,620
" .....	0	8	20,592**

\* 'Zoologischer Anzeiger,' xvii. no. 454; summarized in 'Nature,' vol. L. p. 553.

† 'Cassell's Nat. Hist.' vol. vi. p. 205; also cf. W. B. Lord, 'Crab, Shrimp, and Lobster Lore,' p. 95.—According to Bertram, 'As a general rule, the great bulk of Lobsters are not much more than half the size they used to be' ('The Harvest of the Sea,' p. 274).

‡ L. C. Miall, 'Nature,' vol. liii. p. 154.

§ Cf. Thomson, 'The Study of Animal Life,' 2nd edit. p. 43.

|| *Ibid.* p. 48.

¶ "There is not a living creature," said Mr. Francis Francis, "which inhabits the waters which does not prey more or less on Trout ova" ("The Trout" (Fur, Feather, and Fin Series), p. 171.

\*\* The number of eggs produced by this fish has been given as much greater by more recent writers. "Upwards of two hundred and eighty

Name of Fish.	Weight of Fish.		No. of Eggs.
	lb.	oz.	
Jack .....	28	0	292,320
„ .....	32	0	595,200
„ .....	4	8	42,840
Roach.....	0	12	480,480
Conger Eel .....	28	0	15,191,040
Smelt .....	0	2	36,652
Lump Fish .....	2	0	116,640*

The Codfish (*Gadus morrhua*) is a good example of survival through fecundity. In a specimen weighing thirty pounds, with a roe of only four pounds and a quarter, it has been calculated that there were as many as 7,000,000 eggs, and in some cases the number may be 9,000,000.† Here, besides other natural enemies, man again is a great destroyer. Describing the Cod-fishing off the coast of Labrador during the time of his visit (1833), Audubon writes:—"As there may not be less than one hundred schooners or 'pickaxes' in the harbour, three hundred boats resort to the bank each day; and, as each boat may procure two thousand Cods per diem, when Saturday night comes about six hundred thousand fishes have been brought to the harbour."‡ According to Prof. Seeley:—"The banks of Newfoundland and adjacent coasts have been fished since the year 1500. Here one man may take upwards of five hundred fish in a day, and in a year he is reckoned to capture ten thousand, though sometimes fifteen thousand may be caught in a single voyage."§ As regards the wholesale destruction of the spawn of this fish, a single instance will suffice. In one bird colony alone on the wild coast of Norsk Finmarksen—that of Svaerholt-Klubben—are "millions upon millions" of the small Gull (*Rissa tridactyla*). The food of these multitudes of birds during the summer months consists for thousand have been taken from a fish of half a pound in weight" ('Royal Nat. Hist.' vol. v. p. 336).

\* 'Life of Frank Buckland,' by G. C. Bompas, 2nd edit. p. 252. — "A Turbot of 8 lb. carries 300,000 eggs; a Sole of 1 lb. 130,000 eggs" (*Ibid.* p. 263).

† It has been suggested that the greatest loss to the succeeding generation takes place at the very earliest stage of the egg, in that a large proportion of the ripe eggs discharged in the water are not fertilized by the spermatozoa, and hence perish (McIntosh and Masterman, 'The Life-Hist. Brit. Marine Food Fishes,' p. 236).

‡ 'Audubon and his Journals,' vol. ii. p. 422.

§ 'Cassell's Nat. Hist.' vol. v. p. 59.

the most part of fish-spawn, more particularly that of the Cod-fish, which is abundant in these northern waters.\* The annual take of Herring is prodigious. It has been computed that a million of barrels, representing 800,000,000 fish, are taken in Scotland; the Norwegian Herring fishery is as productive as the Scotch fishery; the English, the Irish, the French, and the Dutch fisheries are also very productive. Estimating the gross produce of these four fisheries at only the same amount as the Scotch fishery, 2,400,000,000 Herring must be annually taken by these four nations—the British, the French, the Dutch, and the Norwegian. Yet the destruction of Herring by man is probably insignificant compared with that wrought by other natural agencies. Mr. James Wilson, in his 'Tour round Scotland and the Isles,' vol. ii. p. 106, says, when describing St. Kilda:—"Let us suppose that there are 200,000 Solan-Geese in the colony of St. Kilda (we believe, from what we saw, the computation moderate), feeding there or thereabouts for seven months in the year. Let us also suppose that each devours (by itself or young) only five Herrings a day—this amounts to one million; seven months (March to September) contain 214 days, by which, if we multiply the above, the product is 214,000,000 of fish for the summer sustenance of a single species near the island of St. Kilda."† Cod and Ling, of which three and half millions were taken in Scotland in 1876, feed largely on Herring, six or seven being often found in the stomach of a Cod. These, it is thought, may consume twelve times as many Herring as the four nations together. Gannets, of which 10,000 dwell on Ailsa Craig, must catch more Herring than all the fishermen of Scotland; Whales, Porpoises, Seals, Codfish, Dogfish, predaceous fish of every

\* G. Lindesay, 'Fortnightly Review,' November, 1894.—Codfish are also infested with parasitic Copepoda. According to Surgeon Bassett-Smith, it is rare to find a fairly grown Cod without being able to take many specimens of the small semitranslucent *Anchorella uncinata* attached to the folds about the lips and in the gill-cavity. In its mouth and on the palate will be seen frequently half a dozen specimens of *Caligus curtus*; on the gills, deeply embedded, a *Lerneæ branchialis*, and on the body sore places where a number of *Caligus mülleri* have been fixed. And, although this investigator considers that in the great majority of cases these parasites are not prejudicial to the life of the fish, he describes *Lerneæ branchialis* as a certain exception to the harmless rule (Ann. & Mag. Nat. Hist. 6th ser. vol. xviii. pp. 9 and 10.

† Cf. J. M. Mitchell, 'The Herring, its Nat. Hist. and National Importance,' p. 37.



description, are constantly feeding on them from the moment of their birth. The shoals of Herring in the ocean are always accompanied by flocks of Gulls and other sea-birds, which are continuously preying upon them, and it seems therefore no exaggeration to conclude that man does not destroy one Herring for every fifty destroyed by other enemies. The destructive power of man therefore is insignificant when it is compared with the destructive agencies which nature has created; and nothing that man has done, or is likely to do, has produced, or will probably produce, any appreciable effect on the number of Herring in the open sea.\* In 1781 the town of Gottenburg alone exported 136,649 barrels, each containing 1200 Herrings, making a total of about 164,000,000; but so rapid was the exhaustion of the fish from this keen pursuit, that in 1799 it was found necessary to prohibit the exportation of them altogether.† This is a conclusion somewhat opposed to the opinion of Frank Buckland, as related above; but our aim here is only to show what multifarious dangers the Herring survives.‡

The Salmon deposits nearly a thousand eggs for every pound of its live weight. But nature is prolific in her waste, and a whole army of her poachers have to be satisfied. "So true is this, that the yearly yield of the largest Salmon-producing river in the kingdom is computed at about the produce of *one female fish* of from fifteen pounds to twenty pounds in weight."§ Mr. J. W. Willis Bund, the Chairman of the Severn Fishery Board, estimates that of Salmon eggs only 10 per cent., or 100,000 per million, hatch out. "Nothing Trout like better than Salmon ova; Eels regard it as a delicacy; while Water-hens, Water-Ouzels, Crows, and other birds, as soon as any part of the bed of the stream is either uncovered, or has only a few inches of water in it, go over it again and again, picking out the tit-bits the ova are to them."|| As to the mortality at the subsequent stages, estimating the number of ova hatched as 1,000,000 out of

\* 'Life of Frank Buckland,' by G. C. Bompas, 2nd edit. pp. 313-14.

† 'Das Leben des Meeres,' p. 182. — Cf. Marsh, 'Man and Nature,' p. 120, *note*.

‡ The excessive spermatozoa of the Herring sometimes whitens the water for scores of square miles (Matthias Dunn, 'Contemp. Rev.' lxxvi. p. 200).

§ Thomas Watson, 'Poachers and Poaching,' p. 165.

|| 'The Life of a Severn Salmon,' p. 7.

10,000,000 in the Severn, it is estimated that between 50 and 75 per cent. of the Alevins pass into the Fry stage, thus bringing the quantity to about 700,000. "In the Fry and Samlet stage the mortality increases to what degree is mere guess, as there is little, if any, evidence; but the mortality must be 50 per cent., so that there would be 350,000 Smolts. Among the Smolts there is also a very high rate of mortality, say, at least 75 per cent., so that the fish that reach the Grilse stage would be something like 40,000 out of 10,000,000 ova, or 4000 per million, about 4 per cent."\* In Kamschatka the Salmon have probably fewer enemies, as the rivers literally swarm with them; and Guillemard refers to one "little village" where, during the season, "20,000 fish would be no uncommon catch for a single day."† The same author describes his impressions when standing on the banks of a little branch of the Avatcha River, not more than eighteen inches deep. "Hundreds were in sight, absolutely touching one another, and, as we crossed the river, our horses nearly stepped upon them. Their back-fins were visible as far as we could see the stream, and aground and gasping in the shallows, and lying dead or dying upon the banks, were hundreds more. . . . The millions of fish that are caught, and form the food throughout the year of almost every living creature in the country, are, however, as nothing compared with the countless myriads that perish naturally."‡ Krashenniker, writing more than one hundred years ago, says:—"The fish come from the sea in such numbers that they stop the course of the rivers, and cause them to overflow the banks, and when the waters fall there remains a surprising quantity of dead fish upon the shore, which produces an intolerable stink." Guillemard considers that the vast majority—practically all, in fact—ascend the streams to spawn, and, having once done so, die. In the case of some species every fish appears to perish; in others a few get back to the sea.§ Besides other enemies, when Salmon are abundant and lie close a dreaded disease makes its appearance. This shows as a white fungus about the head and shoulders, and gradually spreads until the fish sickens and dies.|| The female

\* 'The Life of a Severn Salmon,' p. 11.

† 'Cruise of the Marchesa,' 2nd edit. p. 68.

‡ *Ibid.* p. 73.

§ *Ibid.* p. 92.

|| John Watson, 'Sketches of British Sporting Fishes,' pp. 3-4.

Sturgeon (*Acipenseridæ*) deposits enormous numbers of extremely minute eggs, the product of a single individual having been estimated at upwards of three millions during a season. This fecundity is necessary to preserve the species, when, apart from other enemies, we read that upwards of fifteen thousand have been taken by fishermen in a single day at one of the fishing stations on the Russian rivers.\* Many other instances of great fecundity among fishes might be given, but at least reference may be made to the testimony of Mr. Henry Lee, that a large Octopus produces in one laying, usually extending over three days, a progeny of from 40,000 to 50,000; and the same authority, confirming the observations of Johann Bodasch, found that in the mop-like mass of spawn belonging to a Squid (*Loligo vulgaris*) there were probably 42,000 perfect young Squids.†

Among mammals, the Rat is very prolific. Frank Buckland was told by a trustworthy Westminster ratcatcher that the Rat will breed every seven weeks, and that the female will begin to have young as early as fourteen weeks old.‡ The same author, referring to a little book on the Rat written by a Mr. Shaw, "of ratcatching notoriety," states that "his little dog Tiny, under six pounds weight, has destroyed two thousand five hundred and twenty-five Rats, which, had they been permitted to live, would, at the end of three years, have produced one thousand six hundred and thirty-three millions, one hundred and ninety thousand, two hundred living Rats."§ "Every wild Rabbit who lives to old age has probably been concerned during its life as one of two partners in the production of not less than three hundred young Rabbits." Yet in England no perceptible increase is visible, and we must conclude "that out of three hundred Rabbits born, only two survive to middle age, on the average; the rest being either killed and eaten by carnivorous animals, or (more rarely) dying through inability, for some reason or another, to obtain food."|| The Hamster (*Cricetus frumentarius*) possesses marvellous powers of reproduction, and frequently appears in count-

\* 'Royal Nat. Hist.' vol. v. p. 514.

† Cf. H. Woodward, 'Cassell's Nat. Hist.' vol. v. pp. 161 and 166.

‡ 'Curiosities of Nat. Hist.' Pop. edit. vol. i. p. 69.

§ *Ibid.* p. 70.

|| Wells and Davies, 'Text-Book of Zoology,' p. 128.

less swarms. They have a host of enemies, and Buzzards, Owls, Ravens, and other predaceous birds thin their ranks by hundreds; while among four-footed foes, Polecats and Stoats follow the track of the advancing legions, and kill them where and when they can. The Polecat and Stoat are, moreover, able to follow the Hamster into the recesses of their burrows, where they probably destroy them by hundreds.\*

Innumerable illustrations might be chosen from the life-histories of insects. Prof. Miall observes:—"Winter, of course, brings many hardships upon aquatic insects, as the great reduction in their number proves. The enormous number of eggs laid by so many of them is doubtless connected with the heavy risks to which they are exposed during half the year."† Of one of the May-flies (*Polymita virgo*) Réaumur states:—"The short life of the winged female compels her to deposit her 700 or 800 eggs at once, without much discrimination of likely and unlikely places." Of the Pine Sawfly (*Lophyrus pini*), whose larvæ are frequently found in such numbers in pine-woods, it has been said:—"When young, and also just before turning into pupæ, the grubs are very susceptible to sudden cold or heavy rain, which kill off thousands. In addition to these destructive agencies, nearly forty different kinds of parasites infest the grubs, while mice devour numbers of the pupæ."‡ Among the Threadworms (*Nemathelminthes*) parasitic Nematodes produce enormous numbers of eggs. Van Beneden states that 60,000,000 have been computed in a single Nematode, and this multiplication of ova is absolutely necessary, for the chance of the embryo reaching the right host, in which alone it can develop, is always a small one.§

This excessive fecundity in some animal life finds its parallel in plants. Thus it has been computed that a plant of *Sisymbrium sophia* yields 730,000, one of *Nicotiana tabacum* 360,000, one of *Erigeron canadense* 120,000, and one of *Capsella bursa-pastoris* 64,000 seeds yearly.|| Probably in this case, and in a state of

\* Lydekker, 'Roy. Nat. Hist.' vol. iii. p. 126.

† 'Nat. Hist. Aquatic Insects,' p. 18.

‡ F. O. Pickard-Cambridge, 'Roy. Nat. Hist.' vol. vi. p. 17.

§ Cf. A. E. Shipley, 'Cambridge Nat. Hist.' vol. ii. p. 162.

|| Kerner and Oliver, 'Nat. Hist. Plants,' vol. ii. p. 878.



nature, a great check to increase is to be found in the difficulty the seeds experience in finding a proper soil in which to germinate, as well as in other sources of destruction.

The advantages of, or the part played by fecundity in the preservation of many species is evidently of the most complete and far-reaching character. This seems particularly and more frequently the case with fishes,\* the reasons for which are not difficult to comprehend. It has been urged that the pale colour of the under side of fishes makes it more difficult for enemies to detect them from beneath; but this is probably a truism without denoting any evolved protection, and may be due to other causes. The survival is probably owing to fecundity alone, which prevents extermination from the many foes and adverse conditions which environ their lives. One may stand before the tank in a large aquarium, and be impressed with the assimilative colouration of the upper sides of flat-fishes to the sandy or pebbly bottom on which they rest, but still no difficulty is experienced in distinguishing the living creatures; and if this be so, and with our untrained perceptions, how much stronger must be the detective powers of those natural enemies whose prey is their necessity! The 130,000 eggs said to be carried by a Sole of one pound weight is probably the factor which prevents annihilation, and not a moderate disguise which, without deceiving ourselves, is still less likely to mislead enemies whose lives depend on its destruction. Nature is here quite "careless of the single life," but, by fecundity, "so careful of the type." In our oceans and rivers the course of evolution has decided that the most prolific shall survive, and this is probably with fish the great factor of protection. Here individuality is lost, and Providence is with the big battalions.

\* Of course it is not suggested that all fish survive through fecundity alone. The European Goby (*Latrunculus pellucidus*) and the Sea-Stick-back (*Gastrosteus spinachia*) have apparently been proved to die within a year of their birth. In these cases other protection seems to be afforded. According to Dr. Günther, the fish spawns in June and July. In April the males lose the small teeth, which are replaced by very long and strong teeth, the jaws themselves being stronger. The teeth of the females remain unchanged. In July and August all the adults die off ('Introd. Study Fishes,' p. 487). In this case the male may defend the progeny. *G. spinachia* is, on the same authority, a "nest builder, choosing for its operations especially the shallows of brackish water which are covered with *Zostera*" (*ibid.* p. 507).

If there is truth in this view, it should be emphasized by the fact that animals of great fecundity, as a rule, possess little protective disguise in colouration or markings, and this, in a great measure, appears to be the case, despite the somewhat contrary evidence which tends to be deducible from the colours of many flat-fishes. Even in this case we must remember that other senses besides those of sight may be used to discover a semi-concealed prey. The extreme hardihood of certain animals after injury is also an agency in "survival." Prof. McIntosh relates that "a full-grown female Picked-Dogfish was captured in the stake-nets for Salmon some years ago with its stomach distended with food. In dissecting the apparently dead animal in the laboratory the heart pulsated actively, though it and the pericardium were covered with old and recent lymph, caused by the irritation of a large Cod-hook, the point of which projected into the pericardium, and against which the heart seemed to impinge during contraction. An Eel will live for a year or two with a hook projecting through the gut into the abdomen, and the glutinous Hag (*Myxine*) is also hardy under similar circumstances."\* In so often seeking for the explanation of animal survival by mimetic or assimilative disguises, we are probably endeavouring to open too many locks with one key.

Colour alone may prove a false analogy to protection. Mr. Beddard has well observed :—"The bluish and white colour of many Gulls is generally allowed to be of protective value ; in any case, they are not unlike their usual surroundings. For three years several of the common species of Gulls have a brownish speckled plumage, which is totally unlike that of the old bird ; if one colour is advantageous, the other must be the reverse ; and three years is either a considerable period, or not long enough."† Another illustration is from a writer who, recording his views as to protective resemblances in South America, describes the well-known butterfly, *Ageronia feronica*, which rests with its wings expanded horizontally. When seen on the "grey lichens or bark of the tree-trunk," it is "then so like in colour and markings to the surface on which it rests that it is practically invisible

\* 'Journal of Mental Science,' April, 1898.

† 'Animal Coloration,' 2nd edit. p. 29.

at the distance of even a few yards.”\* This observer, however, at the same time refers to the statement of Bigg Wither, that this very insect is called the Whip-butterfly, owing to the sharp whip-cracking sound made by its wings when battling with its fellows in the air, and that this sound makes it the easy prey of a forest-bird, locally known as the “Suruqua,” who thus detects and secures it. Here the apparent protection, by “protective resemblance,” is invalidated by a peculiar and unusual sound-producing quality, which is as equally dangerous as its colour is reported protective. A similar remark may be made as to the musical *Cicadidæ*. How often have the usual green and brown colours of these insects been adduced as an example of protective resemblance, and not without reason if we regard only the difficulty of distinguishing them on the branches or leaves on which they rest. But when we desire to capture them, their shrill noise proclaims their retreat, and their assimilative colouration avails them little. This has frequently been the experience of the writer when in South Africa.† Mr. Burr writes :—“ I have often stalked down our large *Locusta viridissima*, L., and have usually found it on a bed of nettles or thistles, in the middle of a corn-field, or in stubble, invariably much farther away than I at first expected. The sound appears to come from almost beneath one’s feet, but, on walking straight towards it, seems to recede into the distance, until it suddenly strikes the ear, very harshly and shrilly at close quarters. As soon as the would-be capturer approaches the sound ceases, and the insect remains invisible. The assimilation of the green colour of the insect and the green surroundings, which it always chooses as a band-stand, is so close, that it is almost impossible to detect the creature until it recommences to chirp, when the rapid movement of the elytra betrays its whereabouts.”‡ Frank Buckland wrote similarly of the Green Tree-Frogs of Germany :—“ I have frequently heard one singing in a

\* C. W. Tait, ‘Entomologist,’ vol. xxvii. p. 52. (The author’s name by a misprint appears as W. C. Mit.)

† That birds do destroy Cicadas is a fact well known. Mr. Blanford found the *Accipiter Nisus sphenurus*, in Abyssinia, “living on *Cicadæ*” (‘Obs. Geol. and Zool. of Abyssinia,’ p. 295). Cf. also Swinton (‘Insect Variety,’ p. 21); Belt (‘Naturalist in Nicaragua,’ p. 230); Hudson (Trans. N. Zeal. Instit. vol. xxiii. p. 20); Riley (‘Science,’ v. p. 521).

‡ ‘Zoologist,’ 4th ser. vol. i. p. 516.

small bush, and, though I have searched carefully, have not been able to find him; the only way is to remain quite quiet till he again begins his song.”\*

The aquatic larvæ known as the Small “Bloodworm” (*Tubifex rivulorum*) is another instance of an animal whose colouration is a lure to its destruction, and whose fecundity can alone enable it to survive. The angler knows how readily a dish of Gudgeon can be procured with this bait; whilst other well-known ground fishes, such as the Loach (*Cobitis barbatula*), and the Miller’s-thumb (*Cottus gobio*) also greedily attack it. These small worms live in great numbers in the mud at the bottom of streams, and, as Mr. Beddard has observed, as “the head-end is fixed in the mud, while the tail waves about freely in the water, these worms form exceedingly conspicuous red patches, which must attract ground-feeding fish.”†

It is often urged that few observers have seen butterflies attacked by birds, and that therefore their protective and warning colours are little needed against these as foes. Similar remarks have been made with reference to other animals. Thus Mr. Andrew Lang writes:—“On the Dee, Salmon sometimes rise to March Browns, and take the artificial March Brown tied rather large on these occasions. I have never seen a Salmon take a natural fly, any more than I have seen a phantasm of the dead”; yet he adds he “can believe on good evidence that Salmon do take natural flies.”‡ Undoubted trustworthy accounts do exist also as to avian attacks on Lepidoptera, and the writer has witnessed not a few, though the occurrence is somewhat uncommon. Eimer once came across a large concourse of white and blue butterflies on a high plateau of the Swabian Alp: “On my approach a number of birds (Stonechats) flew from the spot, and when I came up I found a number of maimed butterflies lying fluttering on the ground; pieces had been bitten from the wings of most of them—indeed the wings were often torn to pieces

\* ‘Life of Frank Buckland,’ by G. C. Bompas, 2nd ed. pp. 56-7.

† ‘Animal Coloration,’ 2nd edit. p. 6. — According to Prof. Miall, the colour of the larva of *Chironomus* is due to a blood-red pigment, which is identical with the hæmoglobin of vertebrate animals, and “only such *Chironomus* larvæ as live at the bottom and burrow in the mud possess the red hæmoglobin” (‘Nat. Hist. Aquatic Insects,’ p. 130).

‡ ‘Illustrated London News,’ February 10th, 1894.



before the birds succeeded in getting the bodies of the butterflies, although these were sitting quietly on the ground.”\* Mr. Riley Fortune states that he has often seen Starlings chasing butterflies.† The Stonechat greedily devours butterflies, as I have seen in the aviaries of Dr. Butler. Zehntner on different occasions found seven Painted Lady butterflies in the mouths of Alpine Swifts (*Cypselus melba*), as recorded in the ‘Catalogue des Oiseaux de la Suisse.’‡ Such an observation did not miss the lynx eyes of Jefferies: “I once saw a Flycatcher rush after a buff-coloured moth, which fluttered aimlessly out of a shady recess; he snapped it, held it a second or two while hovering in the air, and then let it go. Instantly a Swallow swooped down, caught the moth, and bore it thirty or forty feet high, then dropped it, when, as the moth came slowly down, another Swallow seized it and carried it some yards and then left hold, and the poor creature after all went free. I have seen other instances of Swallows catching good-sized moths to let them go again.”§ These moths were probably inedible species, and were thus protected, at least at this stage of their existence. Mr. Furneaux, referring to the common and well-known white butterflies of the British *Pieridæ*, observes: “It is remarkable that we are so plagued with ‘whites’ seeing that they have so many enemies. Many of the insect-feeding birds commit fearful havoc among their larvæ, and often chase the perfect insect on the wing.”|| Another writer states: “At no stage in their lives are lepidopterous insects free from the attacks of enemies. In the egg state they fall a prey to beetles and small birds, and as larvæ they are extremely liable to receive a deadly thrust with the ovipositor (or sting) of an ichneumon. . . . The enemies of the imago, whether butterflies or moths, are numerous. Birds, Bats, dragonflies, &c., pursue and harass them whenever they happen to meet with them.”¶ Fungi are also parasitic on butterflies.\*\* But the discrepancy in experience as found among

\* ‘Organic Evolution,’ Eng. Transl., p. 118.

† ‘Ornithology in relation to Agriculture and Horticulture’ (1893), p. 139.

‡ Cf. Gurney, ‘Trans. Norf. and Norw. Nat. Soc.,’ vol. vi. p. 259.

§ ‘Wild Life in a Southern Country,’ p. 147.

|| ‘Butterflies and Moths’ (British), p. 144.

¶ F. O. Pickard-Cambridge, ‘Roy. Nat. Hist.,’ vol. vi. p. 80.

\*\* J. C. Rickard, ‘Entomologist,’ vol. xxix. p. 170.

field naturalists on these points tends to prove how partial or moderate must be the danger in the present day, and how considerably more intense it must have been in some former time to have prompted the evolution of the wonderfully simulating guises, which we can only conceive as evolved for protective purposes.

A repetition of observations will frequently qualify the premises on which many conclusions are based. Many recorded facts are of course utterly erroneous. Thus in 1666 Schefferus records in the 'Philosophical Transactions' that Swallows sink into lakes in autumn, and hibernate in a manner precisely similar to Frogs. In 1741 Fermier-Général Witkowski made legal testimony to the effect that two Swallows had been taken from a pond at Didlacken in his presence in a torpid state; that they eventually regained animation, and after fluttering about, died some three hours after their capture. In 1748 the great Swedish chemist Wallerius wrote that he had on several occasions seen Swallows clustering on a reed until they all disappeared beneath the surface.\* Thus a traveller in a tropical forest might from paucity of observation form a wrong impression as to the relation of the liane and the stem or tree to which it is attached. He would frequently find "the hard basal parts of a liane stem twisted and coiled apparently around nothing. This is due to the fact that the original support had been killed, and then, slowly rotting into dust, has been denuded away by the wind and rain." Our traveller might then record the murderous action of lianes as of a somewhat universal character. But further observations would show the action quite reversed. As Kerner describes the process: "If the erect young stem is stronger and more vigorous than the twiner which encircles it, which has been used as a prop, it does not allow itself to be strangled; the twiner is destroyed when they both increase in thickness. The coils of the climber are gradually stretched tighter and tighter, and many are the contrivances which exist for preventing the tension from immediately acting injuriously on the movement of the sap in the interior of the twining liane stem. As this thickening continues, the pull on the coils becomes so great that the death of the liane results."†

\* Cf. Dixon, 'The Migration of Birds,' 2nd edit. p. 54.

† Kerner and Oliver, 'Nat. Hist. Plants,' vol. i. p. 682.

Similarly an explanation may be long deferred till one branch of science is sufficiently advanced to illuminate another. Discoveries in botany and entomology have often reacted on, and supplemented each other. Prof. Drummond has quoted an instance which will serve our purpose here:—"More than two thousand years ago Herodotus observed a remarkable custom in Egypt. At a certain season of the year the Egyptians went into the desert, cut off branches from the wild palms, and, bringing them back to their gardens, waved them over the flowers of the date palm. Why they performed this ceremony they did not know; but they knew that if they neglected it the date crop would be poor or wholly lost. Herodotus offers the quaint explanation that along with these branches came certain flies possessed of a 'vivific virtue,' which somehow lent an exuberant fertility to the dates. But the true rationale of the incantation is now explained. Palm trees, like human beings, are male and female. The garden plants, the date bearers, were females; the desert plants were males; and the waving of the branches over the females meant the transference of the fertilizing pollen dust from the one to the other."\*

The time has arrived when the whole theory of "protective resemblance" and (or) "mimicry"† requires to be expressed and understood in two senses, *viz.* Demonstrated, and Suggested or Probable. I propose also to give instances of what may be considered as Disputed or Mistaken Mimicry, and likewise Purposeless Mimicry. In considering these questions one is reminded of the three kinds of Phantasms as understood by the Stoics. Those that were probable, those that were improbable, and those that were neither one nor the other. Or perhaps still better, the three categories of Renan. "The first, which is unfortunately very limited, is the category of certainties; the

\* 'The Ascent of Man,' pp. 310-11.

† The term "mimicry" is often considered as first applied in nature by its great enunciator, H. W. Bates. Some years ago I pointed out ('*Rhopalocera Malayana*,' p. 33, *note*) that Henfrey in 1852 had already used the term in connection with botany. Mr. Scudder subsequently ('*Butterflies E. U. States and Canada*,' vol. i. p. 710) showed that Kirby and Spence had anticipated Henfrey in 1815. Boisduval also, in 1836, drew attention to the phenomena (*cf.* Coe, '*Nature versus Natural Selection*,' p. 161).

second, that of probabilities; and the third, that of dreams,"\* By the term "Demonstrable" is implied all those instances where protection, absolute or partial, has been or can be demonstrated by experiment or actual observation. "Suggested or Probable" should, however, be applied to those examples where, because we see similarity of structure, markings, or colour, we assume—and probably often correctly—that protection is involved, though no direct knowledge of the same is obtainable. As an illustration, we know that certain Diptera, *Eristalis* spp., resemble Bees, and we conclude that this simulation has arisen by evolutionary means for protective purposes. It must nevertheless be remembered that the Bee itself is not absolutely protected by its sting, and does not possess a corresponding immunity from the attacks of all its enemies. Mr. Woodford, on Peel Island, Moreton Bay, observed Bees of the genus *Bombus* caught and devoured by Spiders.† Prof. Lloyd Morgan's experiments, however, demonstrate protection at least from birds:—"To another group of chicks I just gave Hive Bees, which were seized, but soon let alone, and then the Droneflies (*Eristalis*), which so closely mimic the Hive Bee. They were left untouched. Their resemblance to the Bees was protective."‡ Frank Buckland relates:—"A gentleman in Oxfordshire had a hive of Bees in the cavity of a wall. A common Toad which had taken up its residence in a hole close by was observed to walk forth and place himself at the mouth of the hive, and so catch the Bees in their coming from and returning to the hive with much dexterity and activity. After witnessing the Toad at work for some time, and feeling convinced that, if his depredations were suffered, he would eventually destroy the whole hive, the owner of the Bees killed the robber, and on inspecting his stomach it was found full to repletion of dead Bees."§

\* 'Philosophical Dialogues and Fragments,' Eng. Transl., p. 5.

† 'A Naturalist among the Head-hunters,' p. 70, note.

‡ 'Habit and Instinct,' p. 52.

§ 'Curiosities Nat. Hist.,' pop. edit., vol. i. pp. 42-3.—According to Mr. Pocock, and as a result of an experiment, a Spider treats both Bee and *Eristalis* with the same caution when found in its web ('Roy. Nat. Hist.,' vol. vi. p. 62). That the Bee has no special immunity is attested by Mr. Pickard-Cambridge, who states that another hymenopterous insect, *Phylanthus triangulum*, in its larval condition feeds upon the Honey Bee. "Since



No specialist who works long at any large group of animal forms, especially at insects, can escape meeting with these problems. This is particularly discovered when, in monographing a family, species are found resembling insects belonging to another order. Thus, in recently working out some Hemiptera for the 'Biologia Centrali-Americana,' I found in the family *Lygaeidae* a species with all the superficial form and colour of an Earwig (*Forficula*) belonging to the order Orthoptera; while among the *Lygaeidae* and *Capsidae* were many species which mimicked Ants (Hymenoptera). To add to the problem, *Lygaeidae* and *Capsidae* were found mimicking one another. Dr. Thorell made a similar observation in monographing Burmese Spiders. *Ligdus chelifera* "is a small flat Spider belonging to the family *Salticoidae*, and resembles very much a Cheloneth (Pseudoscorpion); *Prolochus longiceps* has some resemblance to an Orbitelarian Spider of the genus *Meta* (*M. segmentata*, f. inst.)."\* Now, in the first case, and, alluding to the writer's own experience, it appears we have "Suggested or Probable Mimicry," because we possess no knowledge whether these Hemiptera are found with the Earwigs and Ants they mimic, nor whether they are avoided or neglected by enemies because of this mimicry. We can only report that these insects are mimics one of another as seen in our cabinets, and that as nothing is, or can be, predicated as purposeless in nature, neither can these assimilative forms be meaningless; and, further, arguing from demonstrated knowledge in other cases of mimicry being protective, the presumptive evidence is that the theory of protection affords the clue to the origin of the mimetic guise of these insects. But this is only circumstantial evidence of the weakest description, and, though we may believe as a matter of biological faith, based on analogous cases in nature, that this is the explanation, it is probable, or more than probable, that the progress of science is retarded by confounding scientific suggestion with

at least five Bees are provided for each larva, the havoc caused in hives where these insects abound must be considerable" (*ibid.* p. 36). The Horse Bot Fly (*Gastrophilus equi*) also resembles the Honey Bee in size, colour, and form, but protective mimicry here seems an altogether unwarranted assumption, as the larval fly is parasitic in the alimentary canal of the Horse.

\* 'Descrip. Catalogue Spiders of Burma,' Introd. p. xiii.

scientific demonstration.\* It is simply teleology come back to the house newly swept and garnished. To the teleologist everything in nature proclaimed design, and a precisely similar view—only differing in terminology—is held by an extreme wing of our own Darwinian army; the only distinction is, that the design in one case was attributed to a supernatural providence, in the other, to an all-sufficing power represented by the term Natural Selection. That the teleologist was in no way inferior, but in many instances—so far as power of observation was concerned—surpassed the knowledge of many of our contemporary entomological evolutionists, is a fact that can be easily realized by perusing the exhaustive Letter XXI. in Kirby and Spence's 'Introduction to Entomology,' on "The means by which insects defend themselves." In this letter may be found a wealth of illustration on what we understand as "protective resemblance," &c., not available in any special work written on that theory. How near to modern thought the writer of that letter was, is proved by its last paragraph:—"Another idea that upon this occasion must force itself into our mind is, that nothing is made in vain. When we find that so many seemingly trivial variations in the colour, clothing, form, structure, motions, habits, and economy of insects are of very great importance to them, we may safely conclude that the peculiarities in all these respects, of which we do not yet know the use, are equally necessary; and we may almost say, reversing the words of our Saviour, that not a *hair* is given to them without our Heavenly Father." Even when teleological views and the conception of a special creation dominated the minds of naturalists, the knowledge of the existence of intermediate forms—a postulate of modern evolution—was more or less enunciated. Thus, in the first part of the 'Zoological Transactions,' Mr. Ogilby, in describing the *Cynictis Steedmanii*, a mammal just then discovered in South Africa, remarks: "That the work of creation was originally complete and perfect in all its

\* According to Prof. Miall, when writing on "Flies with Aquatic Larvæ," "The attitude, the mode of breathing, and the mode of feeding observed in the larva of *Dixa* are curiously like those of a certain Gnat larva, *Anopheles*. So close is the resemblance, that an experienced entomologist has, in a published paper, mistaken one for the other. There are few better examples of adaptive resemblance" ('Nat. Hist. Aquatic Insects,' p. 163). But the reasons why this should be considered as *adaptive* resemblance are not stated.

parts ; that no hiatus existed among natural bodies, or, in other words, that no individual stood completely apart from surrounding groups, but that all were connected by a uniform gradation of intermediate forms and characters, is a law of natural history which every day's experience tends more strongly to confirm."\* We sometimes find teleological views in what are presumably put forward as evolutionary suggestions. Thus Mr. Harting, in discussing the migrations of Ceylonese butterflies, is inclined to concur with Col. Swinhoe, in considering the explanation "as a sudden exodus from the birthplace, leading to a compensating reduction of the species, after a season exceptionally favourable to its increase."† This "compensating reduction," or rather the method of the same, as thus expressed, seems more logically to denote design or chance, neither of which will explain the phenomena, but may reasonably be adduced to account for the theory. Perhaps one of the most orthodox and thorough-going teleologists was the late Frank Buckland, to whom the poisonous fangs of deadly Snakes were "the apparatus which the omniscient Creator has given to the class of Snakes to enable them to procure their food"; though, he might have added, these divinely-constructed creatures are on that very account gladly destroyed by the orthodox and heretical alike. The real difference between the teleologist and the evolutionist appears to be this. Both search for the phenomenal facts in animal life, but, when found, the teleologist goes no further than enunciating the magical word "Design." The evolutionist, on the contrary, seeks to find how the structure or property has been, and from whence, derived. With the first it is "Fall down and worship"; with the second, "Prove all things." Agassiz considered that the only classification of the animal kingdom was to be found in the plan of creation; "the free conception of the Almighty Intellect matured in His thought before it was manifested in tangible external forms."‡ And again: "I would as soon cease to believe in the existence of one God because men worship Him in so many different ways, or because they even worship gods of

\* Cf. Steedman, 'Wanderings and Adventures in the Interior of Southern Africa,' vol. ii. p. 97.

† 'Zoologist,' 3rd ser. vol. xix. pp. 340-1.

‡ 'An Essay on Classification,' p. 10.

their own making, as to distrust the evidence of my own senses respecting the existence of a pre-established and duly-considered system in nature, the arrangement of which preceded the creation of all things that exist."\*

What we seem to require is a healthy Agnosticism in theoretical science; neither affirmation nor negation, *per se*, but proof. Thus, grant to all a free use of the imagination in scientific theory, but in no case allow it to be confounded with fact, or crystallized into dogma. "What is called 'mimicry' is apparently, in many cases, nothing more than the influence of similar surroundings, acting in a similar manner upon different insects inhabiting the same district."† Or, as Mr. F. T. Mott most enigmatically puts the objection, "The very curious appearances of mimicry, which are often supposed to be protective, but of which a large proportion seem to have no such function, may probably be attributed to sympathetic communication of the vibratory motions which must be passing through the ether in all directions in the neighbourhood of organic life."‡ Animal depredators may, however, be not altogether defeated by "mimicry," which of course predicates the sense of sight only. As Mr. Cornish has well observed, predaceous animals watch for movement to guide them to their prey. "Most of the larger birds, notably Wood Pigeons, remain perfectly motionless for many seconds after alighting in a new place, in order to identify any moving object. On the other hand, the power of scent is a great corrective to animal misconceptions about objects."§ How little is the cause of Darwinism advanced by many exhibitions made at scientific societies! The advocate exhibits—say, insects—which, belonging to different orders, closely resemble each other in colour, markings, or structure, and which he reasonably adduces as an example of "mimicry," but misuses a suggestion as a demonstration. The Darwinian sceptic at once denies the strength of the whole argument, because it cannot be demonstrated as a fact, and has not been put forward as a suggestion only. It is quite possible

\* 'An Essay on Classification,' p. 228.

† W. F. Kirby, 'A Handbook to the Order Lepidoptera,' vol. iv. p. xxiv.

‡ "Organic Colour," 'Science,' June 16th, 1893.

§ 'Animals of To-day,' p. 165.



that truth may exist between the two antagonists, for it seems certain we have not yet *all the explanations* of these mimetic disguises, and discussion may well precede a universal dogma of its causation. Because a phenomenon is frequent in nature, it is not necessarily universal. For instance, the metamorphosis in the early lives of Frogs is an observation of so general a nature as to indicate a constant law; but a land Frog in the Solomon Islands (*Rana opisthodon*) lays very large eggs in the crevices of rocks, and from these emerge fully-developed Frogs.\* We join issue with Prof. Tyler when he states, "Natural science does not deal in demonstrations, it rests upon the doctrine of probabilities; just as we have to order our whole lives according to this doctrine."† This is a cardinal doctrine in natural and apologetic theology, but is the very antithesis of science, natural or otherwise. The man who orders his whole life on probabilities will probably arrive at the conclusion that hope is a very good breakfast, but a most indifferent dinner. A "science" based on probabilities may turn out to be a new system founded on contradictions.

Prof. Herdman, in speaking of the colours of Nudibranchs and their probably protective character, forcibly observes that we cannot gauge the problem by observing the animals in a museum-jar, or as illustrated in a book, or on the wall. "In order to interpret correctly the effect of their form and colours, we must see them alive and at home, and we must experiment upon their edibility or otherwise in the tanks of our biological stations."‡ Such a course would doubtless give many positive and many negative results, confirming in many cases the theory—if it is still to called but a theory—of mimicry, and preventing many hasty and erroneous conclusions in other cases, where mimicry is only a suggestion, and much discredit is brought to the argument. The "law of evidence" might with advantage be studied

\* Guppy, 'The Solomon Islands,' p. 316.—*Hylodes martinicensis* affords another instance (cf. Mon. Berl. Ac. 1876, p. 714).

† 'The Whence and the Whither of Man,' p. 164.—It is only fair to add that this is a book written by an American Professor of Biology, consisting of a series of Morse Lectures delivered at a "Union Theological Seminary," on the agreement that the subject of the lectures was to have to do with "The relation of the Bible to any of the Sciences."

‡ Opening Address, Sect. Zoology, Brit. Assoc. Ipswich, 1895.

by many enthusiastic students in bionomics. Solitary instances, or that of a single species without reference to its congeneric allies, afford but a doubtful testimony to mimetic resemblances. This was clearly seen and enunciated by Darwin himself:—"If Green Woodpeckers alone had existed, and we did not know that there were many black and pied kinds, I dare say that we should have thought that the green colour was a beautiful adaptation to conceal this tree-frequenting bird from its enemies; and consequently that it was a character of importance, and had been acquired through natural selection; as it is, the colour is probably in chief part due to sexual selection."\* In fact, much evolutionary controversy is simply intellectual fencing, and what Schopenhauer has defined as "controversial Dialectic, *Dialectica eristica*." Mimicry, again, is often much obscured by plates in illustrated books which are intended to support the theory. As an example, in the excellent 'Royal Natural History'† appears a coloured plate, entitled "Mimicry in Insects." Here a number of various insects of different orders and diverse habits are brought together in the midst of inappropriate—or inartistic—foliage, with the result that there is no apparent or sufficient mimicry to deceive the most careless enemy, or the most inexperienced entomologist. In fact, as a support to the theory, one can only conclude that either nature, or the artist, is at fault. Again, a comparative immunity from attack is often ultimately proved to be alone the case. A recent writer has observed:—"It is well known, and I have myself observed, that all our 'Cabbage' Butterflies are immune from attacks of birds,‡ presumably because of some unpleasant taste or smell. Wasps, however, have twice been observed by me in the act of devouring these butterflies. Earwigs, too, which undoubtedly possess an unpleasant smell when irritated, fall victims to Wasps, in spite of their malodorous attributes."§

To conclude a discursus, which in itself appears somewhat controversial, it may be better to give some instances of

\* 'Origin of Species,' 6th edit. p. 158.

† Vol. vi.

‡ This is a direct contradiction to the testimony of Mr. Furneaux (*cf. ante*, p. 328).

§ O. H. Latter, 'Natural Science,' vol. vi. p. 151.

what are considered as "demonstrated,"\* and others classed as "suggested or probable," illustrations of the theory of mimicry; and it will be noticed that those in the second category are much more numerous than those included in the first; inference necessarily having so often to be relied upon in the absence of observed facts.

(To be continued.)

\* Of course by this term is meant what has been or can be demonstrated, and hence a careful observation made by a competent traveller must be accepted as decisive, for we can neither all visit the scene of the occurrence nor, if we could, is it certain we might meet with the instance. A remark by Lecky is apposite:—"If anyone in a company of ordinarily educated persons were to deny the motion of the earth, or the circulation of the blood, his statement would be received with derision, though it is probable that some of his audience would be unable to demonstrate the first truth, and that very few of them could give sufficient reasons for the second" ('Rationalism in Europe,' vol. i. p. 9).

ORNITHOLOGICAL NOTES FROM NORTH-  
WESTERN IRELAND.

BY ROBERT WARREN.

It may interest some of the readers of 'The Zoologist' to learn that the White Wagtails (*Motacilla alba*) have again visited the island of Bartragh (Killala Bay) this season on their northern migration. Mr. A. C. Kirkwood, on April 27th, met a solitary bird in the stable-yard at Bartragh, and secured the specimen for a friend's collection. A few days after he met another bird at the same place, which remained only for a few days, and then disappeared. This bird was succeeded by a pair that were seen on May 4th picking up insects on a manure-heap in the farmyard, but they stayed only for a couple of days, disappearing, like the other bird, after they fed and rested. From the fact of these Wagtails having been observed during the spring migration on the island of Bartragh in 1851, 1893, 1897, 1898, and in April and May of the present year, it is more than probable that they pass over Bartragh every spring on their way to Iceland, but are not seen by observers unless northerly winds are blowing at the time of their passage, which cause some birds, from fatigue, to drop down on Bartragh, and feed and rest before continuing their northern journey.

The Bar-tailed Godwits (*Limosa lapponica*) are still remaining about the sands of the bay and estuary. On June 13th I observed several flocks which altogether might number one hundred and fifty birds, and in the midst of a small group, near Moyne Abbey, was a bird exhibiting the red plumage of summer, a very unusual sight in this locality, for out of the many hundreds of birds seen here in summer I have observed only two or three birds in a similar stage of plumage. The birds frequenting this western coast are apparently all immature, too young to assume the red breeding plumage. When at Bartragh on the 5th inst. I saw fully one hundred Godwits on the shores of Bannros Island, and all appeared in the light grey plumage.



When I was returning from Bartragh on the 5th inst. I observed a dark-coloured Duck diving in the channel near Goose Island, and, not being able to identify it satisfactorily with my glass, I let the boat drift up with the tide until within range, when I fired, the bird diving at the shot; but on coming up it rose, when, with my second barrel, I secured a beautiful specimen of an adult male Black Scoter, in perfect plumage. It was the first I met in summer, and, although numbers frequent the open bay in winter, none ever came into the channels of the estuary, so I felt very fortunate in obtaining such a fine specimen so very unexpectedly.

For some days past\* both Curlews and Redshanks have begun to return from their breeding grounds to the estuary, and on the 28th June I was surprised to see three or four Greenshanks on the shore here, the earliest date on which I have ever known them to return from their breeding haunts.

The Sandwich Terns, as usual, were the earliest of our visitors. I saw one on March 26th, but the main body of the flight did not appear in the estuary until the first week of April. Although the Lesser Terns arrived on May 4th, the Common Terns were some days later in arriving. When visiting the Terns' breeding haunts near Killala on June 13th, I found, as usual, the Common Terns confining themselves to the gravelly "Inch," about thirty pairs having nests on it, and perhaps eight or ten pairs of the Lesser Tern; while the Arctic Terns were scattered all over the Ross sands for over half a mile along with the majority of the Lesser, laying their eggs on the bare sand and gravel. The numbers of the Common Terns have diminished, while there has been a great increase in those of the Arctic Tern.

\* This communication is dated July 8th.

## NOTES FROM THE HADDISCOE MARSHES (NORFOLK).

BY LAST C. FARMAN.

OWING to the fine and open winter of 1898 few rare birds paid us a visit. A friend obtained a very beautiful specimen of the Common Bittern, the only one I heard of during the winter, and which was killed by the side of the river Waveney. Wildfowl were exceedingly scarce, and Snipe visited us in very limited numbers, while the Woodcock record was not up to the usual standard.

Redshanks arrived early in March, about twenty-five couples having nested on the Herringfleet and Fritton Marshes, with about the same number of Lapwings.

During the first week in May a Spoonbill took a few days' rest on our marshes before proceeding on its journey, and altogether about seven specimens of this species have been seen in the vicinity of Breydon mud-flats.

The brothers Richard and Cherry Kearton came down from Surrey for the express purpose of photographing a Redshank's and a Dabchick's nest, each containing four eggs, and laid by the side of the Waveney. I have also seen two Snipes' nests, each containing four eggs.

Moorhens have been nesting in numbers, and numerous Terns of the Common Arctic and Black species have, during the month of May, been daily hawking the marsh ditches. I have found several nests of the Yellow Wagtail, Meadow Pipit, Sky-Lark, and Willow Warbler; and in the garden adjoining my house the following birds have successfully reared broods—*viz.* Goldfinch (two pairs), Common Whitethroat (two pairs), Wren (three pairs), Chaffinch (two pairs), Bullfinch, Robin (two pairs), Red-backed Shrike, Hedge Sparrow (three pairs), Blue Tit, Great Tit, Song Thrushes (two pairs), and Tree Creeper.

In a wood near my home I found a Sparrowhawk's nest containing six eggs, which have now been successfully hatched. And I know of three pairs of Redback Shrikes and two pairs of Redstarts in the village ; but I note that Whinchats and Stonechats are very scarce with us this season. Nightingales have bred in quantity. Cuckoos, Swallows, and Martins are plentiful. I have only heard the Wryneck's note once this season, this species having locally decreased very much of late years.

In the early spring I shot a specimen of the Green Woodpecker, and the Great Spotted and Little Spotted species were also in the locality.

During the month of March several Pike were taken from a narrow marsh dyke, ranging in weight from 7 lb. to 25 lb. The latter fish was caught by net with another Pike of 16 lb. weight.

## NOTES AND QUERIES.

## MAMMALIA.

## MARSUPIALIA.

How does the new-born Kangaroo get into the Mother's Pouch?—From an exceedingly interesting book recently published, 'Wild Animals in Captivity,' by A. D. Bartlett, the late superintendent at the London Zoological Gardens, I extract the following:—"The excitement and curiosity evinced by most persons when they witness the young Kangaroo protruding from the mother's pouch naturally leads to the question, 'How it got there?' a question not yet satisfactorily answered. Long have we been trying to unravel the mystery, and some of the ablest naturalists have bestowed considerable attention upon it, and spent much valuable time with a view to solve it." In the Rev. R. Owen's 'Life of Professor Owen,' however, I find a curiously contradictory statement. It is that of a note in Mrs. Owen's diary at so early a date as Nov. 14th, 1844, which appears to definitely settle the above question. She says:—"Also interesting letter from Lord Derby. A Kangaroo at Knowsley has been watched till the matter so long in doubt is cleared up. She has been seen taking the new-born tiny Kangaroo in her fore-paws and putting it in the pouch." It seems almost inconceivable that Bartlett, so intimate as he was with Prof. Owen, should have remained unaware of this fact.—W. BARRETT ROUÉ (Clifton, Bristol).

In reference to the above communication of Dr. Roué, the interesting question of "How does the new-born Kangaroo get into the mother's pouch?" mentioned in 'Wild Animals in Captivity,' remains unsolved, I believe, just as my father stated. I remember many long conversations on that point with my father, who had the greatest opportunity of knowing all about the breeding of these animals, and we came to the conclusion that the worm-like young passed through a duct or canal in the mammary glands from the womb to the pouch, which would only be perceptible at the time of birth. Had Prof. Owen believed that the mother would pick up a miserable naked worm-like creature with her paws and place it in the pouch, I fancy that he would have made that statement long ago. Waterhouse, in his 'Mammalia,' vol. i. Pouched Animals, published in 1846, does not even mention how the young gets into the pouch; he had access to Prof. Owen



and all his papers. Cassell's Nat. Hist., quoting some other authority, says, "The mother places it in her pouch," without giving any idea of how that is performed. It is easy to make a statement, but it is not so easily confirmed. One can understand a Cat or a Dog picking up its young in its mouth and carrying it away, but it is too human-like for a Kangaroo to pick up that wretched worm and put it in her pouch. What would happen if it was born in the jungle in the dark?—EDWARD BARTLETT.

[Lumholtz writes:—"The large Kangaroo bears a young 'no larger than the little finger of a human baby, and not unlike it in form.'\* This helpless, naked, blind, and deaf being the mother puts in an almost inexplicable manner into the pouch with her mouth" ('Among Cannibals,' p. 379). Aflalo states that the actual fact of the Kangaroo's birth was observed at the "London Zoo. . . . It was there proved that the little 'joey' is brought into the world in the usual way, and forthwith conveyed to the comfortable receptacle, and affixed to a teat by the dam, which held the lifeless-looking little thing tenderly in her cloven lips" ('A Sketch of the Nat. Hist. of Australia,' p. 29). There is evidently much confusion on this interesting question.—ED.]

#### AVES.

Is the Whinchat a Mimic?—Referring to Mr. Godfrey's note (*ante*, p. 267) anent this question, my brother and I had indubitable evidence of the imitative powers of *Pratincola rubetra* (*cf.* Zool. 1877, p. 384). Again, I heard one when crossing a meadow in May or June, 1897, near this village, which allowed me to approach within a very few yards whilst singing on the top of a wall; and, although perhaps not gifted with such a range of mimetic powers as the bird heard in 1877, yet it so closely imitated the song of the Blackcap, in addition to the reproduction of call-notes of various birds, as to fairly astonish me. It may be said in passing that whilst executing its imitative performance its attitude indicated intense passion, and altogether different to its movements and habits when it resumed its ordinary song, at which time it was more active and much wilder, and would not suffer a near approach.—E. P. BUTTERFIELD (Wilsden, near Bradford).

Arrivals of Spotted Flycatcher and Nightjar.—The question whether the Spotted Flycatcher (*Muscicapa grisola*) is the last to arrive of our summer migrants must, as far as this district is concerned, be answered in the negative, the Nightjar (*Caprimulgus europæus*) arriving on an average more than a week later. I should like to ascertain from your readers whether

\* This quotation appears to be from Gould's 'Introduction to the Mammals of Australia,' p. 10.

their experience is the same in other parts of Britain. Nightjars here seem to have a partiality for feeding upon *Hepialidæ*, arriving about the time when *H. velleda* appears, and not leaving the heaths for any considerable distance until the end of June or beginning of July, when it is to be seen in the fields near the village feeding upon *H. humuli*. — E. P. BUTTERFIELD (Wilsden, near Bradford).

**The Delinquencies of Starlings.**—Mr. Fox (*ante*, p. 269) asks whether others have observed feuds to exist between Swifts and Starlings. Such quarrels are not at all of uncommon occurrence, and in one haunt at least *Sturnus vulgaris*, is frequently ejected on the arrival of *Cypselus apus* notwithstanding that possession is nine points of the law, being apparently overpowered by mere numbers as I should think, for it is hardly conceivable that Swifts could single-handed be a match for Starlings.—E. P. BUTTERFIELD (Wilsden, near Bradford).

**Starlings nesting in Fir Trees.**—During May last I found small colonies of *Sturnus vulgaris* nesting in the fir trees in Burnt Wood, Emborough, near Wells; every lateral branch at an elevation above eight or nine feet was piled two or three inches deep with dead grass, hay, shavings, &c., and on this were deposited the eggs. I climbed up and examined a clutch of four eggs. The gamekeeper informed me that they nested there annually, which perhaps accounted for such a collection of rubbish.—STANLEY LEWIS (Wells, Somerset).

**Rooks in the West-End of London.**—Some time since (Zool. 1897, p. 87) I wrote that I feared *Corvus frugilegus* had ceased to breed in the West-End of London; but I now have the pleasure to record that this year there have been three nests in a plane tree close to Park Lane, not in the park, but opposite to it. It seems somewhat strange that they should choose such a site when the park was so near.—J. YOUNG (64, Hereford Road, Bayswater).

**Peculiar Conduct of the Woodcock (*Scolopax rusticola*).**—It has been stated that the female of this species carries her young between her legs. I saw a female rise on a moor in this locality on the evening of June 8th, having her legs hanging down, and the hind part of her body being also in a drooping position. Three other birds—all smaller—soon rose from the same point, and flew in quite the opposite direction, their bodies being in the ordinary flying position. All the birds flew about sixty yards, and the female carried on a continual chirping, evidently feigning great pain. I followed up to where she alighted, when she rose and went away in the direction of the others, flying in the same position as at first. I have no doubt but that all this is a peculiar habit for protecting the young

of this species. I am not prepared to say whether the three were all young, or an old bird and two full-grown young, as the male, being smaller than the female, might have constituted one of the number. The three all remained quiet, and rose singly when the female ceased chirping and joined them, having apparently accomplished her supposed purpose of removing danger by her ruse.—WM. WILSON (Alford, Aberdeen).

Corrections to Notes from North-West Australia. — I shall feel obliged if you will kindly allow me to correct one or two mistakes that I made in my notes (*ante*, p. 139):—The Collared Parrakeet I mentioned as occurring here proves to be the Yellow-banded (*Platycercus zonarius*); also somewhat unaccountably I have (p. 142) written Roller (*Eurystomus pacificus*), whereas it should be Bee-Eater (*Merops ornatus*). The Sand-piper I mentioned, Mr. A. G. Campbell has since identified as the Grey-rumped (*Heteractitis brevipes*). He also informs me the Emu-Wren I secured (p. 140) is undoubtedly a new species, and now named *Stipiturus ruficeps*.—THOMAS CARTER (Point Cloates, N.W. Australia).

#### AVICULTURAL NOTES.

**Aiding a Young Cuckoo.**—A young Cuckoo (*Cuculus canorus*) was found here on the 20th June, and was so numbed with the cold and wet that it was quite unable to fly, or even move about. It had evidently flown from the nest a day or two before when the weather was very dry and exceedingly warm. It was taken indoors and put into a cage. Next morning it revived, and was fairly docile to handle. It seemed intermediate in the colour of the feathers between blue and rufous, the white mark being conspicuous on the head. It perched on the uppermost bars of the cage, and seemed to endure confinement with remarkable tranquillity, showing none of the pugnacity incidental to its kind when in a nest, and partaking of the refreshments placed beside it. I released the bird when it had thoroughly recovered near the spot where it was found, and observed that its powers of flight were decidedly superior to other specimens of the same bird which I had seen at a similar age. I did not notice any particular birds approach as it flew out of sight among the dense cover of broom, but a pair of Twites were very demonstrative in the vicinity, and might perhaps have been the foster-birds. Although the tail was short and not fully developed, this bird was well-grown. The behaviour of the young Cuckoo was remarkable for a wild bird just newly confined, showing none of those points of temerity or agitation which act so detrimentally upon more wild animals in early captivity. We may possibly assume that the young Cuckoo can obtain support from various sources when deprived of the foster-birds, and will live apart from them by taking up with other birds,

or in confinement relying upon man himself. — WM. WILSON (Alford, Aberdeen).

## BIBLIOGRAPHY.

**A Proposed Correction.**—Ought we not *all* to *verify* our references? On page 303 the Editor observes that Bonvalot, in his work ('Across Thibet,' vol. ii. p. 64), narrates that Thibetan Horses "feed on raw flesh, as we have seen with our own eyes." There is *no such statement* in Bonvalot's work, 1889, vol. ii. p. 64. (The work is now before me.) He gives us some statements certainly that remind one of the stories of the famous Baron, as when he tells us, vol. ii. p. 73, "In places there were over six feet of snow, and *nowhere* have the horses *less than up to their necks!*"—E. L. J. RIDSDALE (Rottingdean, Sussex).

[We print this note as it was sent for publication. We quite agree with the writer that we should *all verify* our references. Always thankful to be corrected, we again verified our quotation and reference which Mr. Ridsdale disputes, and, to our astonishment, found them *perfectly correct*. We followed a clue to our critic's communication as to the date of publication and quotation from "vol. ii. p. 73," and then discovered that Mr. Ridsdale had confounded two distinct books, and mixed up two different localities. He has disputed our reference to Bonvalot's 'Across Thibet,' published in 1891, by checking it with the same author's totally different work, 'Through the Heart of Asia,' published in 1889!—ED.]



## NOTICES OF NEW BOOKS.

*Darwinism and Lamarckism, Old and New.* By FREDERICK WOLLASTON HUTTON, F.R.S., &c. Duckworth & Co.

DARWINISM no longer flows an undivided stream into the evolutionary ocean; its banks are submerged and offshoots abound, all ultimately reaching the same goal, but by different channels. These reproduced lectures must be read by all who try to keep in touch with the ever-increasing literature of this engrossing subject. Mr. Hutton states that, "in 1887, when the first of these lectures was given, Darwinism was a compact body of doctrine, obscured only by the writings of certain philosophers who imagined that natural selection was a cause of variation." . . . "In 1899 things are different. The confusion alluded to has much increased. Conceptions totally irrelevant to Darwinism have been fastened on it, and all kinds of misconceptions have grown up. Indeed, things have fared so badly since Darwin's death, that I have seen it stated that his flock has scattered, and that the great theory he so successfully reared is in danger of falling to pieces."

Mr. Hutton does not belong to the school of Wallace, which enunciates the all-sufficiency of natural selection, but is a "Neo-Darwinian," accepting Darwin's teaching, and supplementing "the theory of natural selection with *methods of isolation*, which had been either overlooked or had not been brought into sufficient prominence by Mr. Darwin," thus more or less embracing the views of Moritz, Wagner, and Romanes. He joins forces with the pure Darwinians in his position as an opponent of the teaching of the "Neo-Lamarckians."

The reader will notice without surprise the recrudescence of much pure teleology, which is now far from uncommon. Thus we are told, "there are a number of elementary substances in the world which appear to be of no use except to man: for example,

gold, silver, lead, zinc, &c. These must have been intended for his use, for they were useless in the economy of nature until a sufficient amount of intelligence had been reached. Not only were these made for man, but they appear to have been made as rewards for the exercise of his intellect." Again, Mr. Hutton, in discussing "non-utilitarian" characters in animals, has proposed a motive in the evolution of man, whereby the "contemplation of the beauty seen in nature has stimulated his sluggish soul, and has developed his æsthetic and religious faculties." Hence it is a logical sequence to our author that the goal of psychical evolution—for physical evolution in man may be considered as finished—"does not seem to lie in this world." We have attempted to give an outline of the main thesis of these lectures, and, however much we may withhold our assent to many of the propositions, the volume is worth the study of all zoologists who interest themselves in the problems and paradoxes of animal life.

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*Insects, their Structure and Life : a Primer of Entomology.* By  
GEO. H. CARPENTER, B.Sc.Lond. J. M. Dent & Co.

AMONG the very many works of this description which now appear with a certain regularity, the above will hold its place as a compilation conducted with discrimination and written with care. All such works are necessarily more or less compilations; no entomologist of the present day has a complete grasp of the whole subject, and must open an account with the writings of other workers. The high-water mark was reached by Westwood in his 'Modern Classification of Insects,' which, presumably by an oversight, is not included in Mr. Carpenter's reference to 'General Works on Insects.' But since the date of that publication the field of study has been enormously enlarged, not only by the vast accumulation of new facts, but also by what may be now clearly recognized as the evolutionary method. To bridge the chasm that now divides us from Westwood, and to bring his book in line with the knowledge of the day, should be the motive and action of a book we are all awaiting.

For those who wish to possess a handy volume of reference on entomology, which if not altogether encyclopædic shall be at

least trustworthy, and in touch with the knowledge of the day, we can heartily recommend this inexpensive publication; and its writer clearly has the potentiality of producing a yet larger and more exhaustive work on the same subject.

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*The House Sparrow (The Avian Rat) in relation to Agriculture and Gardening. with Practical Suggestions for lessening its Numbers.* By W. B. TEGETMEIER, F.Z.S., &c. Vinton & Co.

*Passer domesticus* is now fully convicted as a pestilent marauder to the crops of our fields and gardens. The verdict is almost unanimous by a competent jury that includes many ornithological authorities once inclined to the non-proven theory. For an absolute acquittal one might appeal in vain to any experienced farmer or horticulturist. It is a purely human parasite. "No Sparrow's nest is ever to be found a quarter of a mile from a human habitation." Its enemies are actual sufferers by its depredations; it is defended by sentiment combined with an utter ignorance of its life-history. This small volume is an excellent review and summary of the reasons that are procurable, and can be multiplied, for an authorized diminution of its numbers by justly incensed agriculturists and gardeners. An appendix by Miss E. A. Ormerod supplies the particulars of the monthly toll it levies on our fields and gardens. In America it is reported by the United States Department of Agriculture "as one of the greatest pests which could have been introduced" into that country.

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*A List of British Birds belonging to the Humber District (having a special reference to their Migrations).* Revised to April, 1899. By JOHN CORDEAUX, F.R.G.S., &c. R. H. Porter.

WE are surprised to find, from a perusal of this "pamphlet"—to follow the designation of the author—that no fewer than 322 species are recorded as inhabiting this district, of which an excellent definition is given in the preface. "This is altogether a very clearly marked and well-defined faunal area, and particularly rich in its avi-fauna, from the fact that off the mouth of the

Humber the two main lines of the autumn immigratory flights converge and overlap." This publication is, however, much more than a "List"; as regards the time of specific appearances it is a veritable manual. The information is concise, and, we need scarcely say, thoroughly authenticated. We will quote the note appended to the Great Bustard (*Otis tarda*): "The last Lincolnshire Bustard was shot in 1818, in Thoresby Field, near Louth, by Mr. Elmhirst, and sent as a present to Sir Joseph Banks. . . . The last two eggs of the Bustard, as the late Sir Charles Anderson, of Lea, told me, were taken in 1835 or 1836, on his father's property at Haywold, near Driffild, on the Yorkshire wolds. On November 11th, in 1864, a dead female Bustard, still warm, was picked up at sea, in Bridlington Bay." A note is attached to every species, and each note will probably afford a subsequent quotation.

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*Faune de France, contenant la description de toutes les espèces indigènes disposées en tableaux analytiques et illustrée de figures représentant les types caractéristiques des genres et des sous-genres.* Par A. ACLOQUE. Préface de ED. PERRIER, professeur au Muséum. Paris: J. B. Ballière et Fils.

IN our last volume (1898, p. 514) we noticed the third part of this very useful publication. The fourth, devoted to the "Mammifères," has just reached us, in which 209 figures are distributed in a space of 84 pages.

The synoptical method is again pursued, and we know of no other work of a similar size where structural characters can be so easily appreciated and used for differential purposes. The illustrations are somewhat coarse, but their help will be appreciated by the young zoologist, and the information afforded is not exclusively for one side only of the English Channel.

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*Cries and Call-Notes of Wild Birds.* By C. A. WITCHELL.  
L. Upcott Gill.

WE all hear and, as a rule, enjoy the cries of wild birds; but how few recognize them; how seldom are they analyzed; how



much more infrequently are they understood! Mr. Witchell endeavours to act the part of interpreter, to give us the reason for these avian cries and call-notes. Now and then a Capt. Burton appears, who can quickly master any human dialect and make it his own, but how little we still know of the *languages* used by the other living creatures who are our contemporaries! Probably sound is not alone their method of communication, but that the gesture-language common to primitive man and mutes may be very largely used by non-human creatures. This little book is worth the study of all lovers of natural life; it is an insight into the loves, hates, and fears of the birds around us. Whether their cries can be rendered by musical symbols is at least open to doubt, but we are very thankful for the attempt. We are glad to be interested in our friendly nuisance the Sparrow. "The male Sparrow, when perched comfortably in sunshine, often rehearses his vocabulary, in a way which indicates an attempt at song. If reared under birds of another species in a cage, the Sparrow has their notes and not Sparrow-notes, though he retains the Sparrow tone of voice, and he may then become quite a pleasant singer."

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*All about Birds.* By W. PERCIYAL-WESTELL. "Feathers"  
Publishing Co. Limited.

THE title of this little book is not quite a happy one, though its contents are a series of clippings from various sources which may be said to be "all about birds." Unfortunately, many of these bear no reference to their authority, and hence possess little value. They likewise appear to be somewhat undigested and ill-arranged, the same heading appearing in different parts of the book with contrary information. Thus: "The rarest existing Bird" appears on pp. 67 and 158; on the first we are told it is the "Horned Screamer"; on the second it is described as "a certain kind of Pheasant from Annam." The information as to "the Great Auk" on pp. 108 and 155 does not agree in details. The remarks as to the Sparrow on p. 52 seem a "little previous," and a perusal of Mr. Tegetmeier's book (*ante*, p. 375) might possibly produce some qualification of assertion.

## EDITORIAL GLEANINGS.

THE 'South Devon Gazette and Kingsbridge Times' of July 7th published a supplement devoted to the memory of Col. George Montagu, from which we reproduce the following extracts :—

"So much interest has been evinced by the finding of Montagu's breast-plate under the flooring over the vaults near the chancel door of our Parish Church (Kingsbridge), that an account of his life and work, and the subsequent uncertainty of his place of sepulture, may not be amiss, for some even solemnly asserted he was buried in the grounds at Knowle. For the reproduction of the following memoir by William Cunnington, F.G.S., written many years ago, we are under obligation to the Hon. Sec. of the Wiltshire Natural History Society :—

"George Montagu was born in the year 1755, at Lackham House, the ancient seat of his family in North Wiltshire. He was the son of James Montagu, Esq., of Lackham, and Elinor, sole surviving daughter of William Hedges, Esq., of Alderton; and was descended from the Honourable James Montagu, third son of Henry, first Earl of Manchester, who, in the reign of Charles the First, by marriage with Mary, daughter and heir of Sir Robert Baynard, of Lackham, obtained the estate. At the age of sixteen George Montagu entered the army as a lieutenant in the 15th Regiment of Foot, and when he had completed his eighteenth year he married Anne, the eldest daughter of William Courtenay, Esq., and Lady Jane his wife, who was one of the sisters of the Earl of Bute, Prime Minister to George the Third. After a few months spent in visiting friends of the bride in Scotland and in Ireland, Lieutenant Montagu's regiment was ordered to embark for America, and the youthful pair had to experience the pain of a long separation.

"'It was at this early period,' says his daughter, Mrs. Crawford, 'that my father first began to turn his attention, whenever opportunity offered, to those pursuits of natural science for which he had so strong a predilection, and for which he was afterwards so much distinguished. He first commenced by shooting any of the more curious American birds, a few of which he preserved with his own hands, though with no further intention at the time than that of presenting them to my mother. The interest which my father had felt from his boyhood in the works of nature, animate

and inanimate, was much increased by the wild grandeur of the scenes which he traversed, and by the novelty of many of the feathered and four-footed tribes that inhabit them. He ultimately determined, however, to limit his researches and his specimens to British Birds and British Zoology generally, thinking that every collection ought to be as complete as possible of its kind, and being desirous that his own should be the result of his practical studies in the wide field of nature. It was thus that he formed that very extensive and beautiful collection of birds for which he was celebrated, and which after his death was disposed of to the Trustees of the British Museum for, I believe, £3000.' At the same time he was gradually collecting materials for two most valuable works, the 'Ornithological Dictionary,' 2 vols. 8vo, published in 1802, and the 'Testacea Britannica,' 4to, in 1803.

"After Colonel Montagu had resided for some time with his family at Alderton House, in the parish of Hullavington, he was induced, by the additional income which he derived from the death of his brother James (who died unmarried), to resign his commission in the Wiltshire Militia, that he might be enabled to devote himself entirely to his favourite pursuits. He then took up his abode at Knowle, near Kingsbridge, in the county of Devon, which, being at no great distance from the sea, gave him ample opportunities for following out his researches in the natural history of the marine molluscs. Here he continued to reside (with occasional visits to the family seat at Lackham) up to the time of his death.

"After many other trials, in June, 1815, the Colonel had the misfortune to tread upon a rusty nail, which pierced his foot and produced a wound; lock-jaw was the result, and this terminated his life at Knowle on the 20th of the same month, in the sixty-first year of his age. He bore his sufferings (which, though of short duration, were extremely severe) not only with the equanimity of a philosopher, but with the fortitude and resignation of a real Christian. His old and attached friend, the Rev. K. Vaughan, of Modbury [Aveton Gifford.—E. E.], who was at his bedside during his last illness, having asked him where he would wish to be buried, his characteristic reply was, 'Where the tree falls there let it lie.' He had always a great aversion to anything like pomp and parade in the ordinary routine of life, and especially in the performance of the last solemn rites. His remains were therefore interred in an unostentatious manner, agreeably to his own request, in the churchyard of the parish in which he breathed his last."

The following are his principal works:—'The Sportsman's Dictionary; or, a Treatise on Gunpowder and Fire Arms, &c.' London, 1792; reprinted in 1803, 8vo. 'An Ornithological Dictionary; or, Alphabetical Synopsis of British Birds,' 1 vol. 8vo, 1802. 'Testacea Britannica; or, Natural

History of British Shells, Marine, Land, and Freshwater, including the most minute, systematically arranged and embellished with figures,' 4to, London, 1803. Supplement to the preceding, 1809, with plates and descriptions of new species. In the 'Transactions' of the Linnean Society he published the following papers:—"Description of three rare species of British Birds," vol. iv. 1796. "Description of several Marine Animals found on the coast of Devonshire," vol. vii. 1802. "On some species of British Quadrupeds, Birds, and Fishes," vol. vii. 1803. "On the larger and lesser species of Horseshoe Bats, proving them to be distinct, with a description of *Vespertilio barbastellus* taken in the south of Devonshire," vol. ix. 1805. "On the Natural History of the *Falco cyaneus* and *pygargus*," vol. ix. 1807. "Of several new or rare Animals, principally Marine, discovered on the south coast of Devonshire," vol. xi. 1809. "Of some new and rare British Marine Shells and Animals," ib. He also furnished six papers to the Wernerian Natural History Society, which were published between March, 1809, and March, 1815.

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THE following very interesting communication has recently appeared in the 'Westminster Gazette':—

"The appetite of the zoological world has been very much whetted of late by the news of the discovery in South Patagonia of a portion of mammalian skin which, it is conjectured, may once have formed part of a genuine *Mylodon*, or Ground Sloth. This interesting animal has long been supposed to be extinct, and its reappearance in the wilds of South America would create a sensation as pronounced almost as if a Great Bustard had again swooped down upon Cavenham Heath, or a Large Copper been brought to the net in the neighbourhood of Whittlesea Mere. To use a departmental expression, some further tidings of the *Mylodon*—whether in flesh or fossil—are just now very much 'wanted,' and besides Mr. H. S. H. Cavendish, the well-known traveller, who has gone forth with confidence to shoot one for the authorities at South Kensington, Mr. George Davis and Mr. Scott, of Aberystwyth, are making tracks for the monster in the Patagonian forests at the instance of the Hon. Walter Rothschild, M.P., the owner of the famous museum at Tring.

"The details of this important, and possibly sensational, discovery come from two different sources, and are somewhat conflicting. Dr. F. P. Moreno, who recently arrived in England, brought with him a portion of the skin (described as being as dry as leather, hairy, and thickly encrusted with some bony substance), which was found hanging in a tree, it being part of a much larger piece which some Argentine officers had dug up in a cavern several years previously. In close proximity were discovered some



half-gnawed stumps of trees, an important clue to the identity of an animal which, unlike others of its species, did not climb the branches, but simply razed them to the ground by means of its prodigious strength. Professor Moreno believes that this fragment of skin belongs to the real *Mylodon*, and that it owes its present state of preservation to certain contributory circumstances which on other occasions have destroyed the potency of the effacing hand of time and weather! The skin has been exhibited before the Royal and Zoological Societies, where it had to pass under the review of some of the leading zoological and geological experts of the day.

"On the other hand, Dr. Ameghino claims to have procured some of the skin from natives, who assured him that they shot the animal, and that owing to the bony lumps it had to be literally hacked from off the carcass. He regards it as a living representative of the *Gravigrades* of Argentina, and has given it the name of *Neo-Mylodon listai*. Be that, however, as it may, the animal in question is—or should be—about the size of a Bear, and in many quarters the possibility that it may yet be found alive is hopefully regarded. If it is alive, it is scarcely possible that it will elude for long the vigilance of so keen and practised a big-game hunter as young Mr. Cavendish, whose name has been given to a new species of Antelope which he recently discovered on his travels in Africa. Up to the present the *Mylodon* has only been found in a fossilized state, its remains having been brought to light in a pleistocene fluviatile deposit not far from the city of Buenos Ayres nearly sixty years ago. There is a complete skeleton, but nothing more substantial, in the Natural History Museum at South Kensington, and there is an almost entire one in the Hunterian Museum of the Royal College of Surgeons. As a consequence, the efforts of those gentlemen who are endeavouring to establish its reality in the flesh are being watched with the closest interest.

"As to the ordinary Sloth, it has been thought by many that owing to the imperfect nature of its formation its existence must be a positive burden to itself; but this is far from being the case, as those know who have seen the agility which it displays in its native state in the forests of America, despite the unequal length of its arms and legs. True, it is absolutely helpless on *terra firma*—in fact, it can neither walk nor stand—but even that is excusable in the case of an animal that not only moves but also rests, and even sleeps, in a state of suspension!

"Since the above was written news has reached England from Patagonia that several huge bones, entire skulls, powerful claws, and a complete hide of the animal have been discovered deep down in a cave by Dr. R. Hauthal, of the La Plata Museum, who had also joined the ranks of the pursuers."—F. P. S.

On July 19th a specimen of the egg of the Great Auk (*Alca impennis*) was sold by Mr. J. C. Stevens, the well-known natural history auctioneer, of King Street, Covent Garden. The history of this specimen is well known. It was formerly in the collection of Comte Raoul de Beracé, having been bequeathed to him in 1834 by the owner of a fishing vessel at St. Malo. It afterwards passed into the possession of Baron d'Hamonville, who was the possessor of four eggs of the Great Auk, which were figured and described in the Mémoires of the Société Zoologique de France for 1888 and 1891. Of the four eggs belonging to the Baron, three have been sold by Mr. Stevens. The exact sum realized by the specimen sold on July 19th was 300 guineas. The egg was slightly cracked, and the dark markings were chiefly at the larger end, where the egg was slightly stained. The bidding commenced at £100. There was a brisk competition between two bidders, the egg being knocked down to Mr. Middlebrook, of the 'Edinburgh Castle,' Hampstead Road, the purchaser of Baron d'Hamonville's previous specimen, that was sold in June, 1895, at Stevens's, to Messrs. Jays, Regent Street, for sixty-five guineas, and afterwards resold at Stevens's, in July, 1897, to Mr. Middlebrook for 160 guineas.

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THE Fortieth Annual Report of the Chicago Academy of Sciences for the year 1897, and dated Jan. 11th, 1898, has just reached us (July, 1899). We notice in the Curator's Report of the Museum that, "through the continued generosity of Mr. George H. Laffin, the Academy has acquired the valuable collection of birds lately owned by Mr. F. M. Woodruff. This collection is particularly rich in the birds of the Mississippi Valley, and also includes nearly every species recorded from the Chicago area."

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THE Duke of Bedford has been elected by the Council President of the Zoological Society of London, to fill the vacancy caused by the death of Sir William Flower.

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WE recently (*ante*, p. 96) recorded the death of Mr. A. H. Everett, the travelling naturalist and collector. We now with equal regret record the decease of Mr. John Whitehead from pestilential fever while on a scientific mission in the island of Hainan. Mr. Whitehead's zoological enterprise in the Philippines is well known to zoologists, and, as our contemporary, 'Natural Science,' truly observes, "as a collector, Mr. Whitehead was highly esteemed, and his death, at the early age of forty-three, will be especially felt in the Natural History Museum at South Kensington, the zoological collections in which have been enriched through his industry and skill."

IN the 'Transactions and Annual Report of the Manchester Microscopical Society' for 1898 is a paper by Mr. A. T. Gillanders on "Scale Insects," from which we extract as follows:—"In many parts of the country the trunks and larger branches of beech trees will be found coated with a white covering, presenting the appearance of a shower of snow having frozen. This pest has been graphically termed the 'Felt Scale' by Miss Ormerod, and the coccid itself is named *Cryptococcus fagi*. Where the pest is but sparsely distributed on the stem little damage accrues; but it is sometimes found about a quarter to half an inch in thickness, and when such is the case the bark separates from the stem, and the tree ultimately dies in consequence. A most interesting and successful remedial measure has been brought under the writer's notice at Blagdon, in Northumberland. With an  $\frac{1}{8}$ -in. auger bore three holes at about equal distance right into the centre of the trunk, about three feet from the ground, and sloping slightly towards the root of the tree. Into these holes place as much flower of sulphur as can be conveniently got in, and then cork them firmly up with a plug of soft wood. This should be done in the autumn, and will be found successful. It was first adopted about thirty years ago, and the trees which were then operated on are now in comparatively good condition. Prior to the experiment they were covered with the scale, were very sickly-looking, and shed their leaves prematurely."

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MR. MATTHIAS DUNN has contributed to the August number of the 'Contemporary Review' a very interesting article on "The Seven Senses of Fishes." These senses are considered and described as sight, touch, taste, hearing, smell, electric dermal sense, and magnetic dermal sense. The "electric dermal sense" affords fishes premonitory warnings of coming storms, and they then—Herrings have been observed—leave the shores "sometimes ten or twelve hours before the coming storm." The "magnetic dermal sense" is a guiding principle. Mackerel, Herring, and Pilchards "swim without error to their desired spawning-beds, sheltered homes, and pleasant feeding-grounds. Now, these fishes cannot, like man, have objects to guide them to their desired haven, in the shape of high lands, lights, and sea-marks; nor can they be aided by telescopic sight in going these long distances, for in the obscure sea, as before shown, this is impossible; hence we conclude that some magnetic principle must assist in guiding them."

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THE 'Wombat,' just received (May, 1899), gives "Ornithological Results during 1898," which reports that during the season just closed "steady progress has been made in Australian ornithology and oology."

We read that "the Garganey or Blue-winged Teal (*Querquedula circia*) of Europe has been added to the list of Australian avifauna, as a pair have been identified that were shot at Lake Connemara, near Geelong (Victoria).

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THE important and well-known ornithological collection of Mr. H. E. Dresser has been acquired by the Manchester Museum (Owens College), through the munificence of a wealthy resident, who elects to be anonymous. This collection is essentially a student's collection, Mr. Dresser having collected a series of all but the very rarest species to show changes of plumage, variation arising from geographical distribution, &c.; and there are no real duplicates, as these have been most carefully weeded out, and all the skins are first-class ones. The Palæarctic collection is the most complete, for of the 743 species (according to the last calculation) found in the Western Palæarctic Area, about 725 are fully represented; and besides these there are about 260 strictly *Eastern* Palæarctic and allied species. All those figured and described in the 'Birds of Europe' are marked, and most of the labels bear notes by the leading ornithologists who have worked at the collection from time to time. Besides the Palæarctic collection, there is a collection of Bee-Eaters, comprising about thirty species, used by Mr. Dresser in writing his 'Monograph of the Bee-Eaters,' and one of Rollers (about twenty-six species), used in writing the monograph of those birds. Altogether the collection comprises about 1040 species and fully 10,000 specimens, and contains a fair number of types.

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It is with the greatest regret that we have to announce the death of our very old and esteemed contributor, Mr. John Cordeaux, of Great Cotes House, Lincoln. We hope to publish a full obituary notice in our next issue.







THE "SEA-ELEPHANT" (*MACRORHINUS ELEPHANTINUS*).